

Predict the bulk properties of multicomponent mixed materials

Fast technique for the study of polymer and surfactant continuous phases

Applications include surface coatings, adhesives, sealants, elastomers, cements, composite materials, gels, and laminates

Materials Science Datasheet

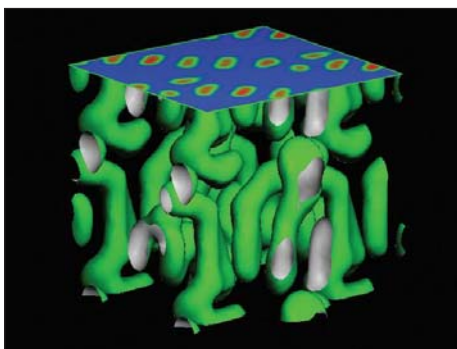
MesoProp

MesoProp is a new research tool which is used to predict the bulk properties of multicomponent nanostructured materials systems. The research applications for MesoProp include studies of polymers, surfactants and continuous phases which are fundamental to the development of surface coatings, adhesives, sealants, elastomers, cements, composite materials, gels, and laminates.

MesoProp is a fully integrated research tool which links the properties of pure components to complex blends. Applications include formulation and simulation studies of block copolymers, polymer surfactants, nanostructured polymer blends, and physical effects at interfaces such as membranes.

MesoProp offers:

- **Predictive studies** to streamline research projects and save costs
- **Faster product development** and shorter time to market
- **A business tool** for cost engineering: optimizing raw materials usage and reducing formulation costs
- **A systematic approach** to process and product development, a wide range of input and output information can be captured and held for future use or later inspection.



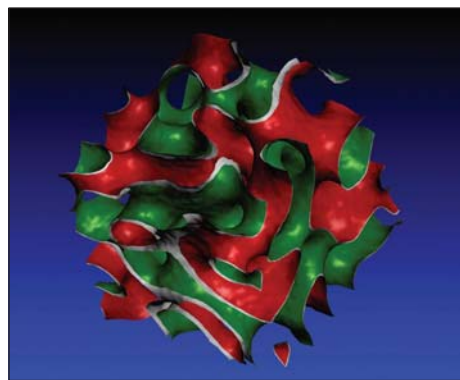
How does MesoProp work ?

MesoProp uses the complex phase morphologies from the MS Modeling MesoDyn and DPD codes to give a dynamic simulation of complex fluid systems at the

mesoscale level. The researcher then selects input data of pure components from the MesoProp database. MesoProp then introduces property calculations using Finite Element Analysis algorithms to produce visual models and output data.

The core algorithms and input databases include:

- Elastic constants (stiffness and compliance)
- Thermal expansion coefficients
- Thermal conductivity
- Electrical conductivity
- Dielectric constants
- Gas diffusion constants.



If the physical property is not covered in the MesoProp database, then MS Modeling polymer property predictor Synthia can be used to calculate:

- Refractive index
- Magnetic moments
- Swelling in solvents
- Liquid diffusion
- Liquid permeability.

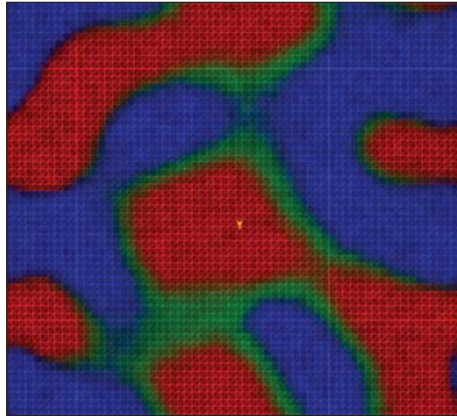
Features and capabilities

- A practitioners tool for technicians, engineers, and formulation chemists
- Provides cost saving solutions for new product and process development
- Uses desktop IT equipment in an office environment, reduces the need for 'live' experiments in wet labs and clean rooms

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- Versatile software package, applicable to up to 10 separate chemical components
- Fast turnaround, several projects can be processed simultaneously. Results displayed for presentations and transferred electronically
- Developed for demanding and highly regulated process industries
- Potential to link MesoProp to production and process engineering software.



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References

The following list of scientific papers relate to the methods used in MesoProp and some practical applications:

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3. A. Gusev, P. J. Hine, I. M. Ward, "Fiber packing and elastic properties of a transversely random unidirectional glass/epoxy composite," *Comp. Sci. Techn.* 60, 535-541 (2000).
4. A. A. Gusev, J. J. M. Slot, "Non-Additive Morphology Effects in Thermal Expansion of Three-Phase Materials," *Adv. Eng. Mater.* 3(6), 427-427 (2001).
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